

Reg. No. :

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Question Paper Code : 60865

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Sixth/Seventh Semester

Mechanical Engineering

ME 2403/ME 73/10122 ME 704 — POWER PLANT ENGINEERING

(Regulations 2008/2010)

(Common to PTME 2403/10122 ME 704 — Power Plant Engineering for
B.E. (Part-Time) Seventh Semester – Mechanical Engineering –
Regulations 2009/2010)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the major advantages of a combined cycle system in the present power picture of the world?
2. List out the major advantages of super critical boilers in modern thermal power plant.
3. In modern thermal plants, mechanical collector with electrostatic precipitator is preferred over single unit. Why?
4. Why air cooled (or dry type cooling) systems are preferred over water cooling system in modern power plants?
5. Why shielding of a reactor is necessary? What do you understand by thermal shielding?
6. What are mini and micro-hydel plants?

7. Why the maximum temperature in the gas turbine cycle is limited to 850°C? Why lean A:F ratio is used in gas turbines and what is the range of it?
8. What are the different fields where use of diesel power plant is essential?
9. Which are the non conventional sources of energy and why they are seriously thought throughout the world?
10. Discuss in detail how the load between two alternators of generating station can be divided for the best economy.

PART B — (5 × 16 = 80 marks)

11. (a) (i) A residential load of a locality is given below :

Time (hours)	0-5	5-6	6-9	9-18	18-21	21-24
Load (kW)	3	7	22	0	15	9

Draw the load curve and find out the load factor and energy consumed during 24 hours. (10)

- (ii) What do you understand by MHD? Explain the working principle of MHD with neat sketch. (6)

Or

- (b) (i) What do you understand by FBC? Explain its working principle with a neat sketch. (8)

- (ii) Draw a neat line diagram of Benson boiler and discuss its relative merits and demerits. (8)

12. (a) (i) Describe the burning sequence of coal in overfeed and underfeed stokers. Which type is suitable and why to burn (1) high ash clinkering coals and (2) high volatile matter coal? (8)

- (ii) What factors are considered in evaluating the performance of electrostatic precipitator? Why this collector does not operate efficiently with power plants using low sulphur coal? (8)

Or

- (b) (i) Explain the principle used in forced and induced draught. Why balanced draught is preferred over forced or induced draught? (8)

- (ii) Describe with neat sketches the different forms of a surface condenser used in steam power plants. List out the factors which are responsible for loss of efficiency in a surface (8)

13. (a) (i) Draw a neat diagram of PWR and BWR and explain the advantages and disadvantages. What are the conditions which prefer PWR over BWR and vice versa? (10)
- (ii) Explain clearly the difference between fast neutrons and thermal neutrons. Explain clearly why thermal neutrons can cause fission of ${}_{92}\text{U}^{235}$ but not of ${}_{92}\text{U}^{238}$. (6)

Or

- (b) (i) Describe the classification of hydraulic turbines in different categories. (6)
- (ii) Explain with a neat sketch the principle of operation of a pelton turbine. (10)
14. (a) (i) Draw a neat line diagram of a diesel power plant showing all the systems. (8)
- (ii) What do you understand by a closed cycle gas turbine plant? List out its advantages over open cycle plant. What difficulties are encountered in the development of closed cycle plant? (8)

Or

- (b) (i) Draw the line diagrams of repowering system using steam turbine only and boiler only. Discuss their relative merits and demerits. (8)
- (ii) Why the supercharging is necessary in diesel plant? What are the methods used for supercharging the diesel engine? What are advantages of supercharging as fuel consumption and overall efficiency of the plant are concerned? (8)
15. (a) (i) Draw a neat diagram of a power generating system illustrating the use of solar thermal central receiver system as a source of energy. (10)
- (ii) Explain the basic principle of OTEC. Define the figure of merit and show its effect on the efficiency of the OTEC power plant taking source temperature as a parameter. (6)

Or

(b) (i) The following data pertains to a power plant of 120 MW capacity :

The capital cost = Rs. 15,000/kW

Interest and depreciation = 10% on capital

Annual running charges = Rs. 20×10^6

Profit to be gained = 10% of the capital

The energy consumed by the
power plant auxiliaries = 5% of generated

The annual load factor = 0.6

Annual capacity factor = 0.5

Calculate (1) the reverse capacity and (2) cost of generation
per kWh. (10)

(ii) What is the significance of two part tariff and three part tariff?
Explain the advantages of each over other. (6)